
Saluda Operation Workshop

Fall - 2005

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SCE&G System Control

Contents

- We are going to talk about **The Grid**
 - We'll talk about **How The Grid Work**
 - We'll talk about **Balancing the Grid**
 - We'll talk about **The Grid Rules** and who makes them
 - We'll talk about **Emergencies on the Grid**
 - We'll talk about why **Saluda** is used in Emergencies
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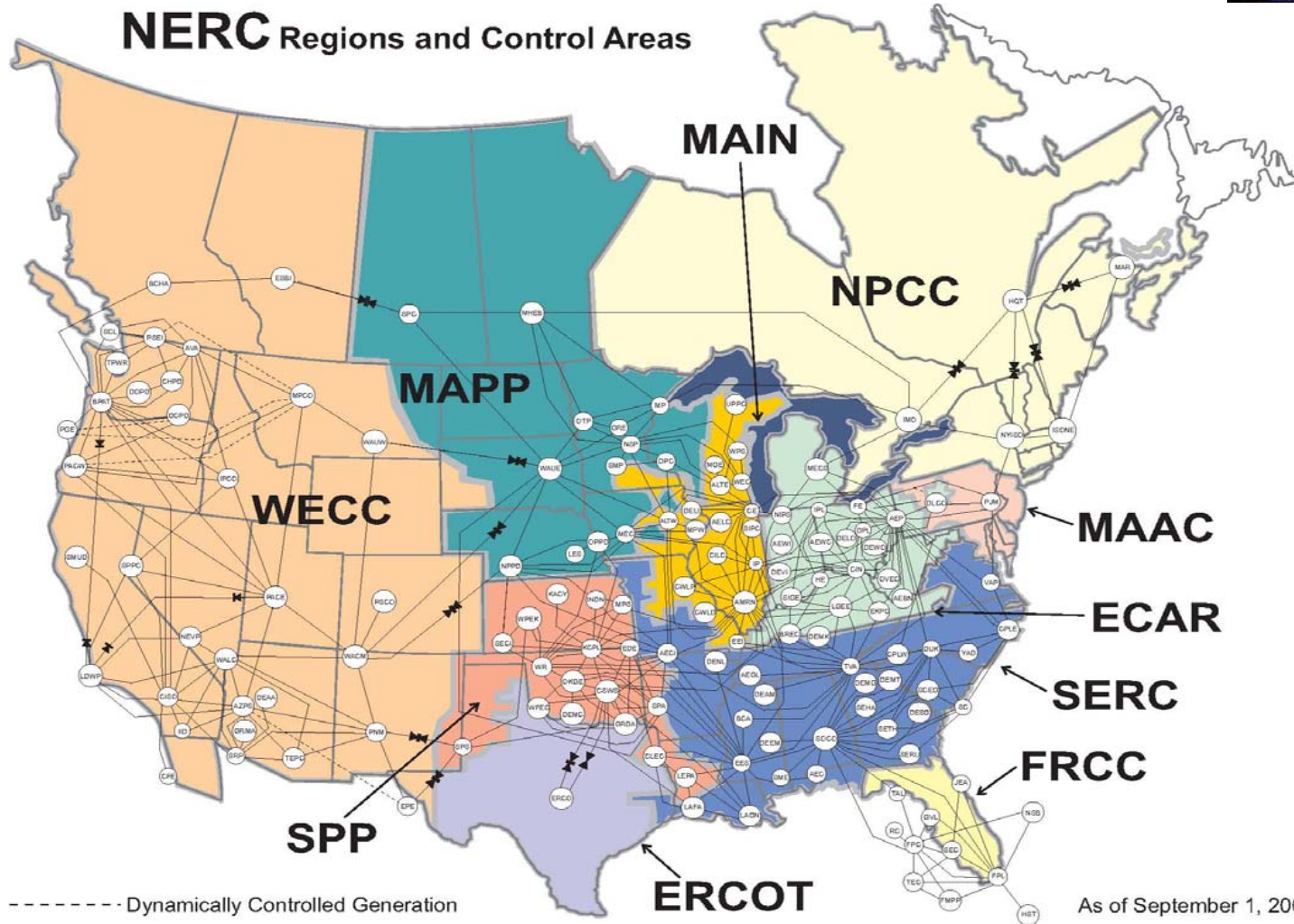
The Grid

What is The Grid? (aka the Bulk Power System)

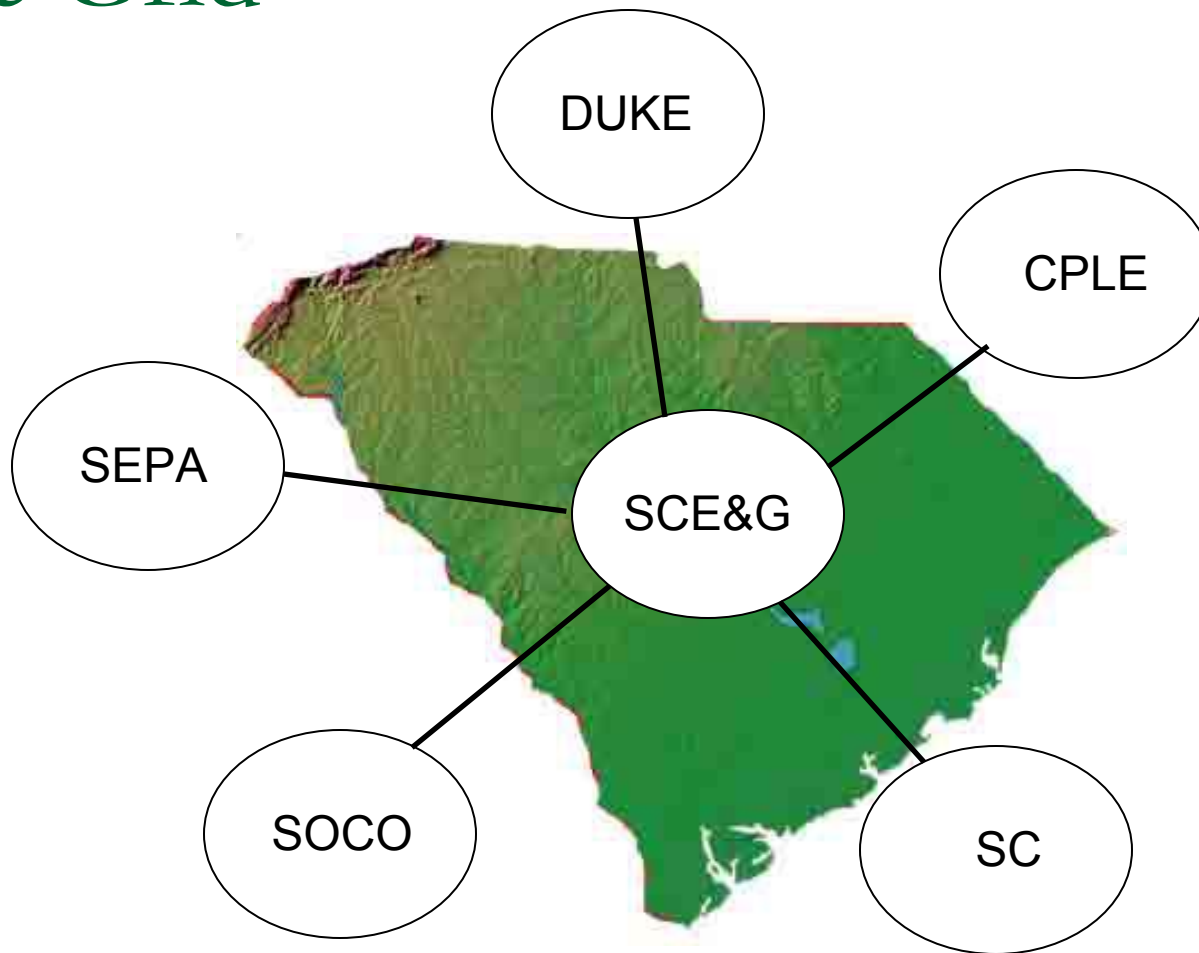


- The large towers you see crossing the highway make up the grid
- Hop on one of these to get across the country at the speed of light

The Grid



The Grid



SCE&G is a Control Area that is connected to 5 other Control Areas

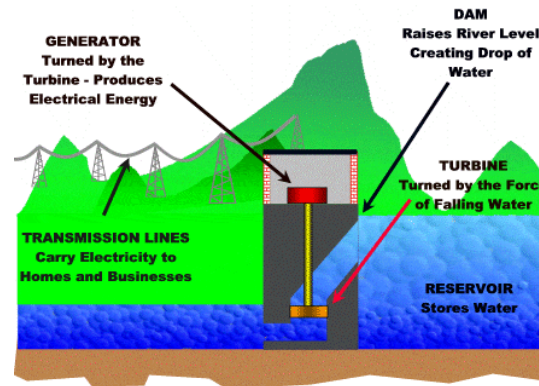
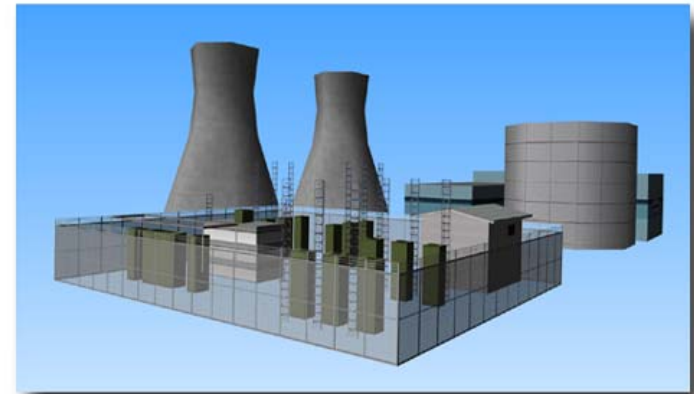
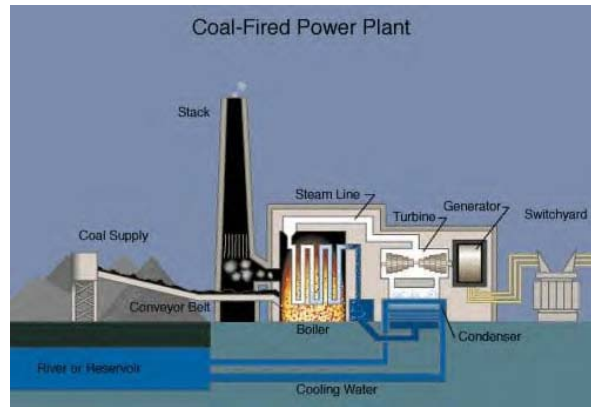
How the Grid Works

The Customers inside Control Areas demand power.



How the Grid Works

Power companies make enough power to meet that demand.



- Fossil
- Nuclear
- Hydro

Balancing the Grid

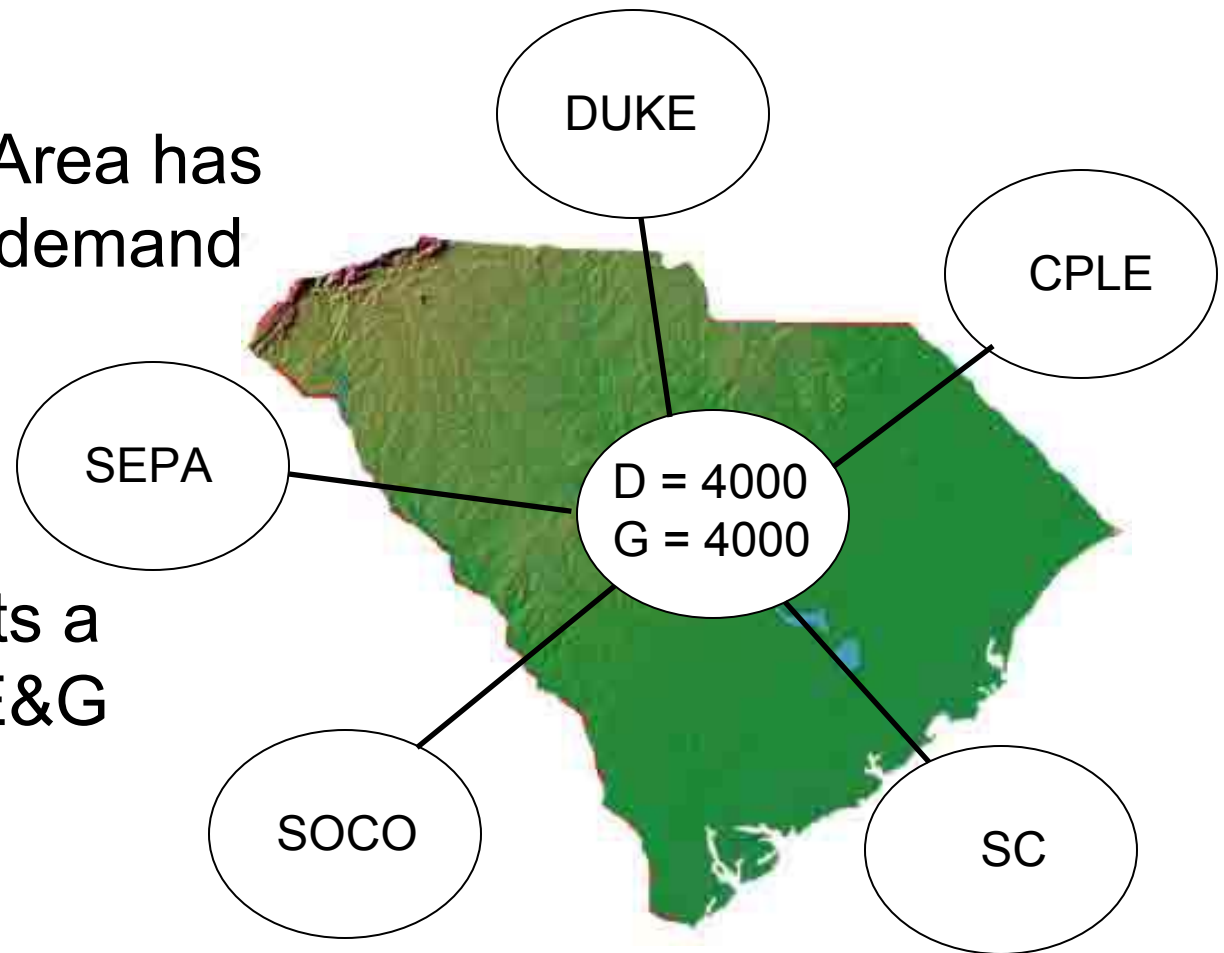
- Once the Demand and Generators are in place. They must be balanced.
 - “Balanced” means that there is enough electricity flowing from the Generators to meet the Customer’s demand.
 - This balance is measured in real time.
 - Remember the speed of light comment?
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Balancing the Grid

- System Controllers match changes in Demand by dispatching Generation
 - Load changes through out the day, but seasonal patterns are basically the same.
 - Winter patterns peak in the morning
 - Summer days peak in the afternoon
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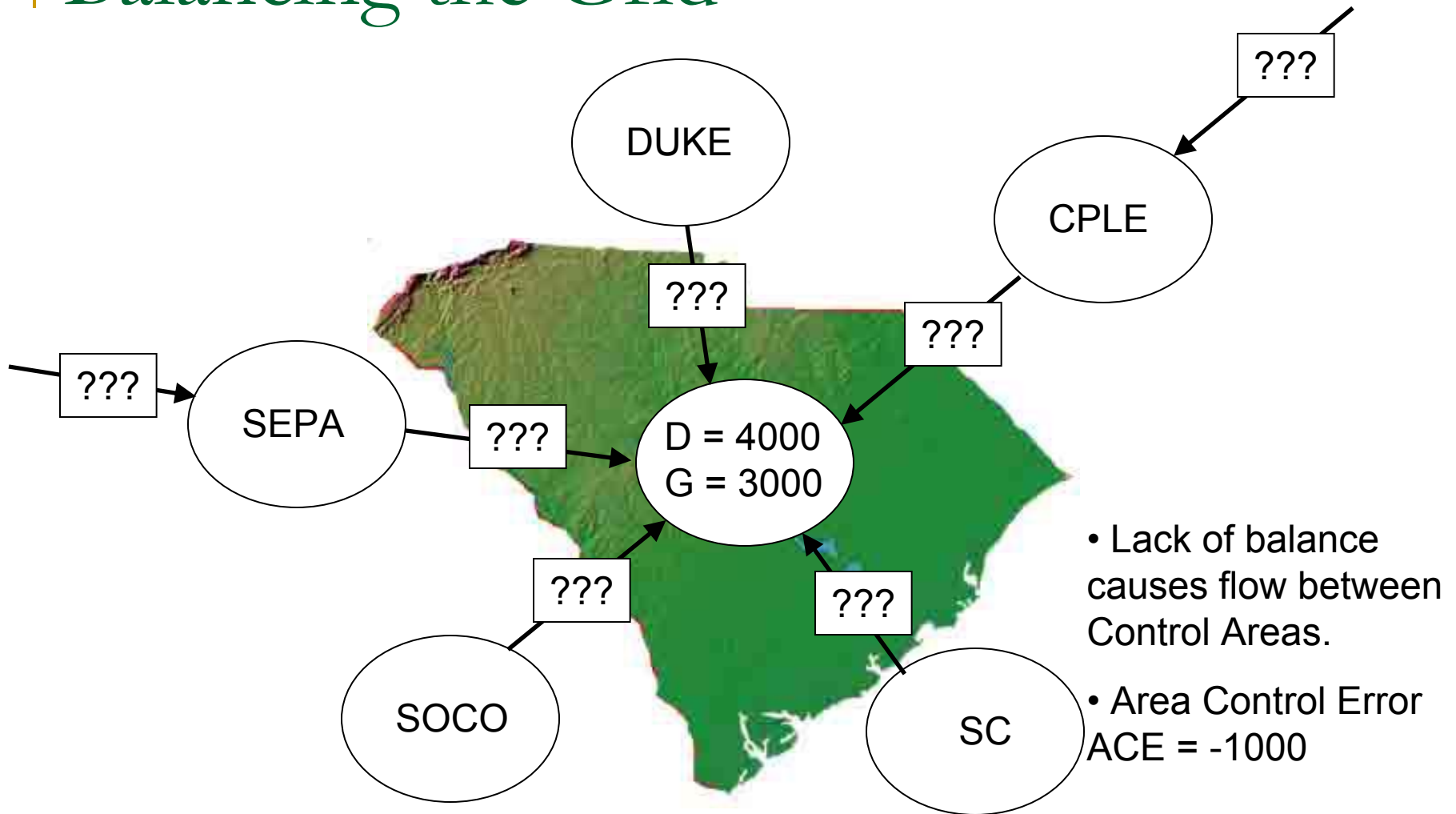
Balancing the Grid

- Each Control Area has to balance its demand

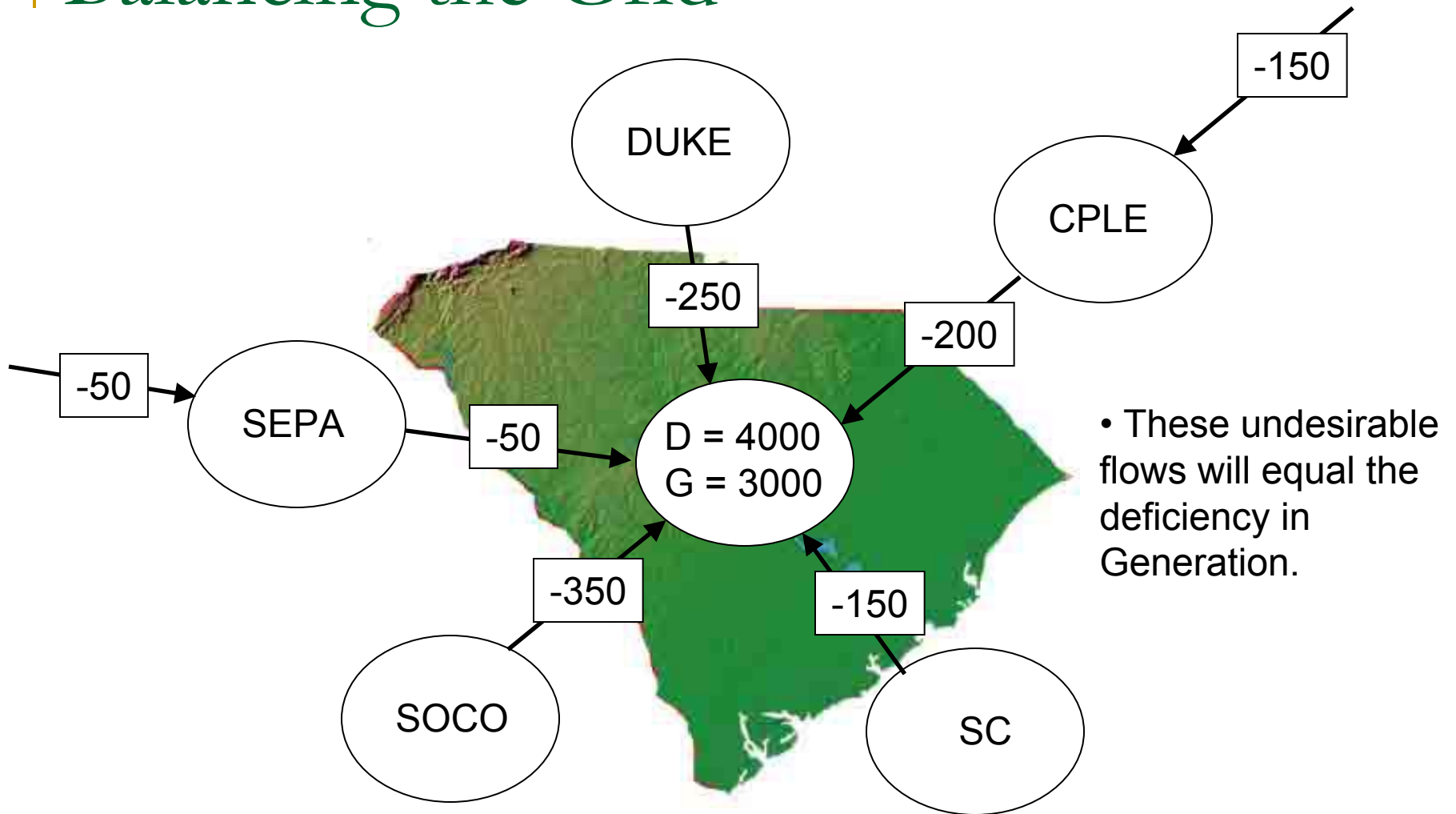


- This represents a balanced SCE&G Control Area

Balancing the Grid



Balancing the Grid



Balancing the Grid

- What causes imbalance? ⁽⁴⁾
 - ❑ Power plants break down – After all, they are only machines.
 - ❑ Fuel problems.
 - ❑ Power lines don't allow power to flow.
 - ❑ Purchased power is curtailed.
 - ❑ Etc...
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Balancing the Grid

- In such a case, what must SCE&G do to return balance? ⁽²⁾
 - 1 – Increase generation
 - 2 – Reduce Demand
- What if SCE&G does not return balance?



The Grid Rules

■ Who Makes the rules?

- North American Electric Reliability Council (www.nerc.com)
- Southeastern Electric Reliability Council (www.serc1.org)
- VACAR – Virginia/Carolinas Subregion.

■ What are the Rules?

- The “NERC Reliability Standards” – over 800 requirements
 - The SERC Compliance Subcommittee monitors compliance.
 - VACAR Taskforces is how we coordinate with our neighbors.
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The Grid Rules

- BAL-002-0 is what requires us to run Saluda the way we do.
 - It says that:
 - As a minimum, the Balancing Authority or Reserve Sharing Group shall carry at least enough Contingency Reserve to cover the most severe single contingency.
 - What is SCE&G's most severe single contingency?
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The Grid Rules

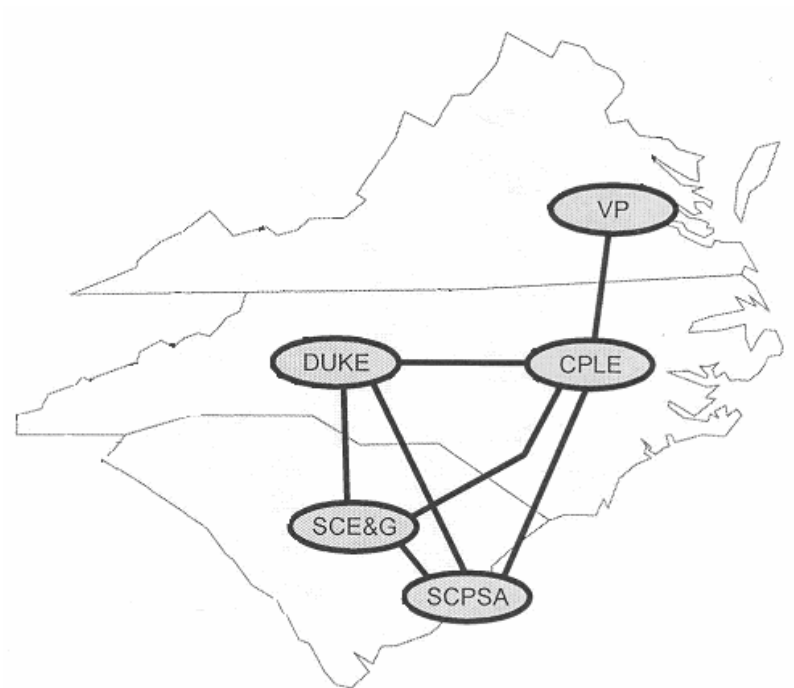
VC Summer Nuclear Station is in Jenkinsville, SC. This plant generates enough power in one hour to power over 1000 homes for 1 month!



Generation Capacity = 1000MWs >>>> We don't want to carry 1000MW in reserves

The Grid Rules

- To avoid carrying 1000MWs in reserves, SCE&G has joined the VACAR Reserve Sharing group.
- The VACAR RSG collectively carries 1500MW in reserves
- SCE&G must carry ~200 of the 1500.



Emergencies on the Grid

- If a Generator trips, the Balancing Authority must recover 100% of the loss in 15 minutes.
 - Only a few units on SCE&G's system can generate up to 200MWs in 15 minutes.
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Emergencies on the Grid

- Compliance reported per incident to VACAR
- Compliance reported Quarterly to SERC.



Emergencies on the Grid

■ Example:

- ❑ Williams Station trips
 - ❑ SCE&G ACE = -600MW
 - ❑ SCE&G has 15 minutes to get 600MW on its system.
 - ❑ Load up 150MW of available units at Fairfield
 - ❑ Load up 200MW at Saluda & call on 250MW of reserves from Duke
 - ❑ Buy 600MW from spot energy market next hour.
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Emergencies on the Grid

- Example 2:
 - CPLE calls SCE&G and calls on 150MWs of contingency reserves.
 - SCE&G deliver in 1 minute on 0MW ramp
 - SCE&G ACE instantly become -150
 - SCE&G now has ??? minutes to recover balance
 - SCE&G loads up 1 last unit at Fairfield Pumped Storage and loads up 1 unit at Saluda.

 - Is that enough?

 - No – SCE&G loads up one more unit at Saluda.
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Emergencies on the Grid

- This is not just a spreadsheet. This is how it really happens.
 - And it happens without warning.
 - After the fact, SCE&G and CPLE report compliance to each other.
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Why use Saluda?

- Increasing generation by 200MW in 15 minutes is not easy.
 - That's about 13.5MW/minute
 - VC Summer Nuclear increases at 1MW/minute
 - SCE&G coal averages 5MW/minute
 - SCE&G can “Quick start” gas turbines for 75MWs – only 50% success rate; not reliable!
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Review

- Generation trips can happen at any time.
 - There is always exposure
 - Summer afternoons and Winter mornings are more likely for sudden emergencies
 - There are many factors that can cause an interruption of generation.
 - There are few warnings.
 - Saluda is the reliable option for assuring the lights stay on.
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Questions?

